SOUTH CAROLINA PUBLIC SERVICE COMMISSION
DOCKET NO. 98-001-E
DIRECT TESTIMONY OF CAROLINA POWER & LIGHT COMPANY

WITNESS MICHAEL J. SETTLAGE

Q. Mr. Settlage, will you please state your full name, occupation, and address?

A. My name is Michael J. Settlage. I am employed by Carolina Power & Light Company as Superintendent - Power System Operations. My business address 411 Fayetteville Street Mall, Raleigh, North Carolina.

Q. Please summarize briefly your educational background and experience.

A. I graduated from Clemson University in 1984 with a B.S. Degree in Electrical engineering. I received a MS in Power Engineering from Clemson University in 1985. I received corporate research fellowships to support my thesis research in short-term power system load forecasting. I have authored or co-authored three (3) technical papers published by the IEEE on the subject of load forecasting. I joined CP&L in 1986 and have held several engineering positions. These include: Senior Engineer in System Operations Planning, Senior Engineer in Dispatcher Training and Support, Senior System Load Dispatcher and Superintendent. As an Engineer in System Operations Planning, I developed and utilized highly detailed hourly power system modeling software. I also: supported the Energy Control Center by developing thermal unit heat rate data; administrated after-the-fact interchange sales billing; performed engineering analysis of the operation of hydroelectric plants; and performed economic analysis of proposed operating regulations. As Senior System Load Dispatcher - Resource Coordinator, I was responsible for coordinating generation resources to ensure optimal economic benefits subject to

various constraints, supporting the unit commitment function, developing after-the-fact analysis of monthly operations performance, and providing engineering analysis of operational issues. In my current position, I am responsible for the economic and reliable operation of CP&L's power system which includes both the generation and transmission resources. I am currently CP&L's alternate member to the SERC Operating Committee. I am a member of the IEEE and received the Outstanding Engineer award for the Triangle Chapter of the IEEE in December, 1993.

Q. What is the purpose of your testimony here today?

A. The purpose of my testimony is to review the operating performance of the Company's generating facilities during the period of January 1, 1997 through December 31, 1997 and the expected operating performance of the nuclear units for the projected period April 1, 1998 to March 31, 1999.

Q. Describe the types of generating facilities owned and operated by CP&L.

A. CP&L owns and operates a diverse mix of generating facilities consisting of hydro facilities, combustion turbines, fossil steam generating facilities, and nuclear plants.

Q. Why does CP&L utilize such a diverse mix of generating facilities?

A. Each type of facility has different operating and installation costs and is generally intended to meet a certain type of loading situation. In combination, the diversity of the system, in conjunction with power purchases made when doing so is more cost-effective than using a CP&L generating unit, allows CP&L to meet the continuously changing customer load pattern in a reasonable, cost-effective manner. The combustion turbines, which have relatively low installation costs but

higher operating costs, are intended to be operated infrequently. They also provide resources that can be started in a relatively short time for emergency situations. In contrast, the large coal and nuclear steam generating plants have relatively high installation costs with lower operating costs, and are intended to operate in a manner to meet the constant level of demand on the system. Based on the load level that CP&L is called on to serve at any given point in time, CP&L selects the combination of facilities which will produce electricity in the most economical manner, giving due regard to reliability of service and safety. This approach provides for overall minimization of the total cost of providing service.

Q. Please elaborate on the intended use of each type of facility CP&L uses to generate electricity.

A. As a general rule, peaking resources such as combustion turbines, are constructed with the intention of running them very infrequently, i.e. only during peak or emergency conditions. Therefore, as a rule, they have a very low capacity factor, generally less than 10%. Because combustion turbines can be started quickly in response to a sharp increase in customer demand, without having to continuously operate the units, they are very effective in providing reserve capacity. Intermediate facilities are intended to operate more frequently and are subject to daily load variations. Because these facilities take some time to come from a cold shut down situation, they are best utilized to respond to the more predictable system load patterns. Additionally, these plants, located across the Company's service territory, contribute to overall system reliability. As a rule, they operate with capacity factors in the range of 10% to 60%. CP&L's intermediate facilities are

predominately older coal plants. Baseload facilities are intended and designed to operate on a near continuous basis with the exception of outages for required maintenance, modifications, repairs, major overhauls, or for refueling in the case of nuclear plants. These plants are traditionally called on to operate in the 60% and greater capacity factor range. CP&L's four nuclear units and four larger coal units constitute the Company's baseload facilities.

Q. How does CP&L ensure that it operates these three types of generating facilities as economically as possible?

A. The Company has a central Energy Control Center which monitors the electricity demands within the CP&L service area. The Energy Control Center regulates and dispatches available generating units in response to customer demand. Sophisticated computer control systems match the changing load with available sources of power. Personnel at the Energy Control Center, in addition to being in contact with the Company's generating plants, are also in communication with other utilities bordering our service territory. In the event a CP&L plant is suddenly forced off-line, the interconnections with neighboring utilities help to ensure that service to our customers will go uninterrupted. Additionally, it allows CP&L access to the unloaded capacity of neighboring utilities so that CP&L customers will be served by the lowest cost power available through inter-utility purchases.

Q. During the review period January 1, 1997 through December 31, 1997, did CP&L prudently operate its generating system within the guidelines discussed in regard to the three types of facilities?

A. Yes. Two different measures are utilized to evaluate the performance of generating facilities. They are equivalent availability factor and capacity factor. Equivalent availability factor refers to the percent of a given time a facility was available to operate at full power if needed. Capacity factor measures the generation a facility actually produces against the amount of generation that theoretically could be produced in a given time period, based on its maximum dependable capacity. Equivalent availability factor describes how well a facility was operated, even in cases where the unit was used in a load following application. CP&L's combustion turbines averaged 92.4% equivalent availability for the twelve-month review period ending in December 1997, and less than 2.2% capacity factor indicating that they were almost always available for use but operated minimally. This is consistent with their intended purpose. CP&L's intermediate, or cycling units, had an average equivalent availability factor of 83.3% and a capacity factor of 48.4%, again indicative of good performance and management. CP&L's fossil baseload units had an average equivalent availability of 86.4% and a capacity factor of 64.4%. Thus, the fossil baseload units were well managed and operated. CP&L's nuclear generation system achieved a net capacity factor of 93.2% for the twelve month review period. Excluding outage time associated with reasonable refueling outages, the nuclear generation system's net capacity factor rises to approximately 100%. Excluding all reasonable outage time further raises the net capacity factor to 104.2%. Importantly, even the refueling outages are not excluded, the system capacity factor was 93.2%. Therefore, pursuant to S.C. Code Ann. § 58-27-865(F), since the adjusted capacity factor exceeds 92.5% CP&L is presumed to have made

every reasonable effort to minimize the cost associated with the operation of its nuclear generation system and to have properly operated and managed its nuclear facilities.

Q. How did CP&L's nuclear production in 1997 compare to previous years?

A. CP&L's nuclear generating plants set all-time Company records during 1997, producing over 25 million megawatt-hours and providing 47.4 percent of the total electric generation. The Brunswick plant near Southport, NC and the Robinson plant near Hartsville, SC, both set station generating records during the year. Each of the two units at the Brunswick plant and the single nuclear unit at Robinson generated over 6 million megawatt-hours during 1997. The single-unit Harris plant near Raleigh generated almost 6 million megawatt-hours during the year. This is the fourth consecutive year the CP&L nuclear units have set a new total nuclear generation record.

Q. What steps has CP&L taken to continue its current high level of nuclear production?

A. CP&L made certain modifications to the Brunswick Plant during 1997 which allowed the Company to seek and receive permission from the NRC to increase the reactor power at which the plant is licensed to operate. The reactor power for Unit 1 was increased in March 1997 and the reactor power for Unit 2 was increased following the fall 1997 refueling outage. By increasing the licensed power level for the plant, increased electrical generation can be expected in the future. During 1998, the maximum dependable capacity (MDC) values for the Brunswick Units will be increased to reflect the new unit capabilities. The MDC for Brunswick Unit

1 will increase from 767 Mwe to 820 Mwe and the MDC for Brunswick Unit 2 will
2 increase from 754 Mwe to 811 Mwe. For reporting purposes these MDC increases
3 were effective January 1, 1998.

4 **Q. You have not specifically addressed the performance of CP&L's hydro units.**
5 **Please discuss their performance.**

6 A. The usage of the hydro facilities on the CP&L system is limited by the availability
7 of water that can be released through the turbine generators. The Company's hydro
8 plants have very limited ponding capacity for water storage. CP&L operates the
9 hydro plants to obtain the maximum generation from them; but because of the
10 small water storage capacity available, the hydro units have been primarily utilized
11 for peaking and regulating purposes. This maximizes the economic benefit of the
12 units. For the review period the hydro units had an equivalent availability of 97.4%
13 and operated at a capacity factor of 5.2%.

14 **Q. How did the Company's fossil units perform as compared to the industry?**

15 A. Our fossil steam system operated well during this review period, achieving an
16 equivalent availability of 84.7%. This exceeds the most recently published NERC
17 average equivalent availability for coal plants of 83.0%. The NERC average covers
18 the period 1992-1996 and represents the performance of 926 units. Equivalent
19 availability is a more meaningful measure of performance for coal plants than
20 capacity factor because the output of our fossil units varies significantly depending
21 on the level of system load. Our larger fossil units, Roxboro Units 2, 3, and 4 and
22 Mayo Unit 1, operated at equivalent availabilities of 71.7%, 94.1%, 84.4%, and

94.0%, respectively. As I mentioned earlier, the baseload coal units achieved an average equivalent availability of 86.4%.

Q: How did the performance of CP&L's nuclear system compare to the industry average?

A: During the period January 1, 1997 through December 31, 1997, CP&L's pressurized water reactors ("PWRs"), Robinson Unit 2 and Harris Unit 1, achieved capacity factors of 103.6% and 78.3% respectively. On average, these nuclear units operated at a 89.5% capacity factor during the test period. In contrast, the NERC five-year average capacity factor for 1992-1996 for all commercial PWRs in North America was 76.0%. Brunswick Units 1 and 2, which are both boiling water reactors ("BWRs"), achieved capacity factors of 102.1% and 91.7%, with an average of 96.9%. The NERC five-year capacity factor average for 1992-1996 for all BWRs was 65.2%. CP&L's nuclear system incurred only a 2.14% forced outage rate during the test period compared to the industry average of 10.79%.

Q. Are you presenting any exhibits with your testimony?

A. Yes. Settlage Exhibit 1 is a graphic representation of the Company's generation system operation for the twelve-month review period.

Q. Please describe the projected performance of CP&L's nuclear system for the time period April 1, 1998 through March 31, 1999.

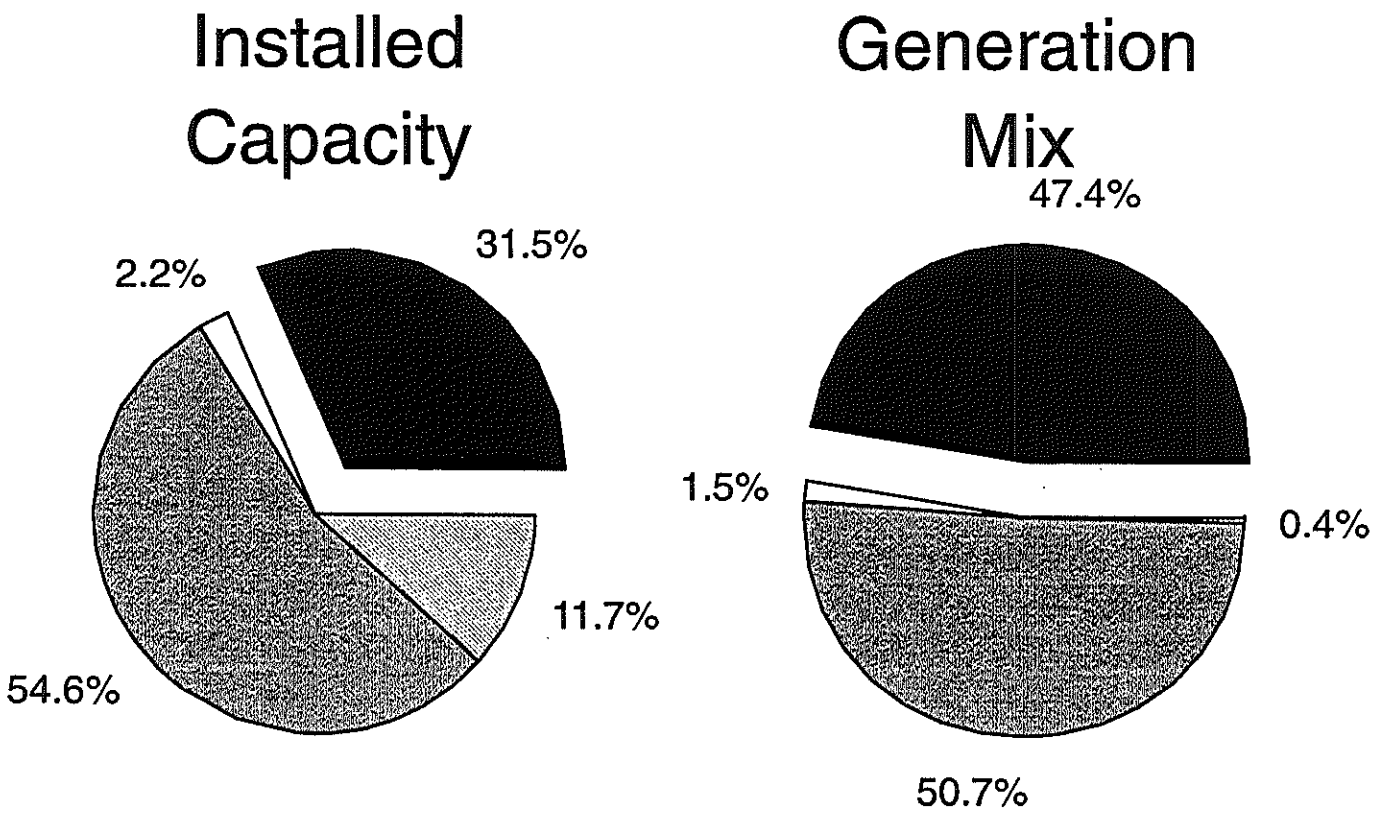
A. Including the impact of planned refueling outages, I project that CP&L's nuclear units will achieve an average net capacity factor of 89.4% during this period.

Q. Does this conclude your testimony?

A. Yes.

31943

Comparison of CP&L Installed Generating Capacity to Actual Generation Mix January 1, 1997 through December 31, 1997



*Darlington Units 11 & 12 were placed in service in June. The installed capacity for 1997 has been prorated to reflect the addition of those units.

Settlage Exhibit 1